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Office Memorandum • UNITED STATES GOVERNMENT

TO : The Files

DATE: 15 January 1959

FROM : [redacted] 25X1

SUBJECT: Conference Report - HG-3 Hand Crank Generator

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1. On 12 January 1959 a conference was held at Alcott Hall with [redacted] of [redacted] to discuss development of the hand crank generator, HG-3. 25X1

2. In the development of the HG-3 the contractor discovered a new design which will eliminate the need for a regulator in the generator circuitry thereby increasing the overall efficiency and decreasing the size of the generator unit. This design has not been completely tested to date, but shows promise as being satisfactory design for the HG-3.

3. The specifications for the HG-3 require an output of 15 watts at one ampere. The contractor first designed a regulator to give a constant current output of one ampere. However, when designing the generator unit, it was discovered that the current can be regulated by proper selection of the permanent rotating magnet and the number of turns in the coil. (See attached diagram.) When the magnet rotates, a magnetic flux φ_1 causes an emf e to be induced in the coil as shown. The induced emf causes a current to flow through the load. This current, flowing through the coil produces a flux φ_2, counteracting the flux caused by the rotating magnet. The flux φ_1 is dependent only upon the rotating magnet, while φ_2 is directly proportional to the magnitude of current flowing through the coil. As the speed of the rotating magnet is increased, the time rate of change of flux φ_1 increases thus increasing the induced emf e. As e increases, the current in the coil increases which increases the opposing flux φ_2. This reduces the effective flux through the core, which reduces the emf, which in turn reduces or regulates the current. This effect continues as the speed is increased until the core becomes magnetically saturated, thereby making the current constant. A plot of current versus rpm of the magnet is given with the attached diagram.

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HANDBOOK GENERATOR, HG-5

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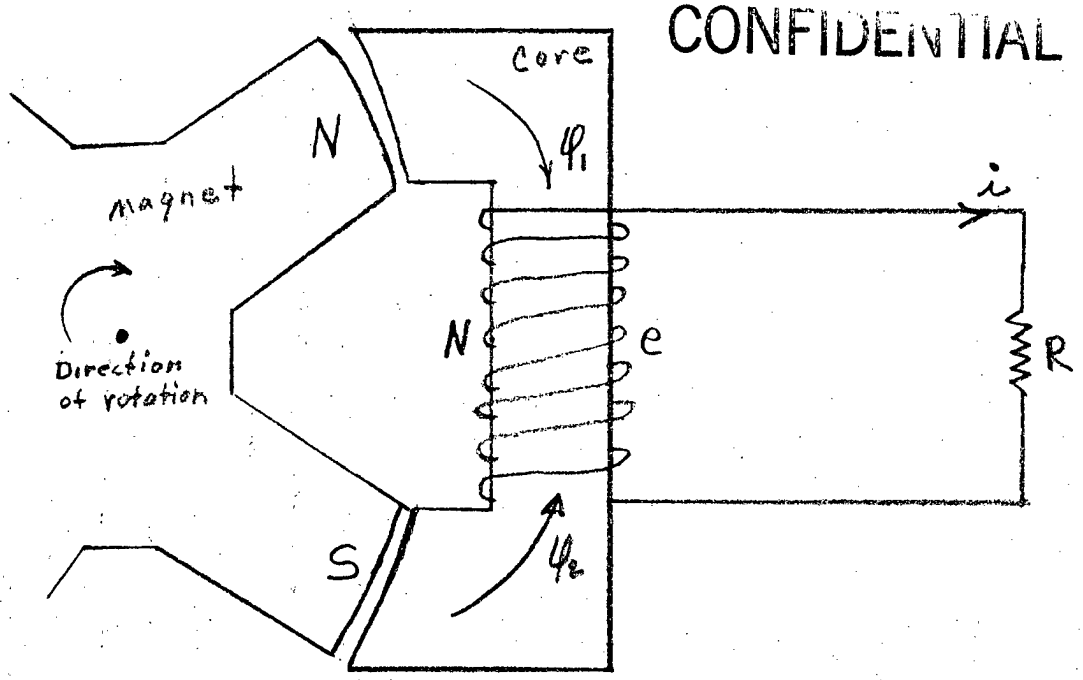
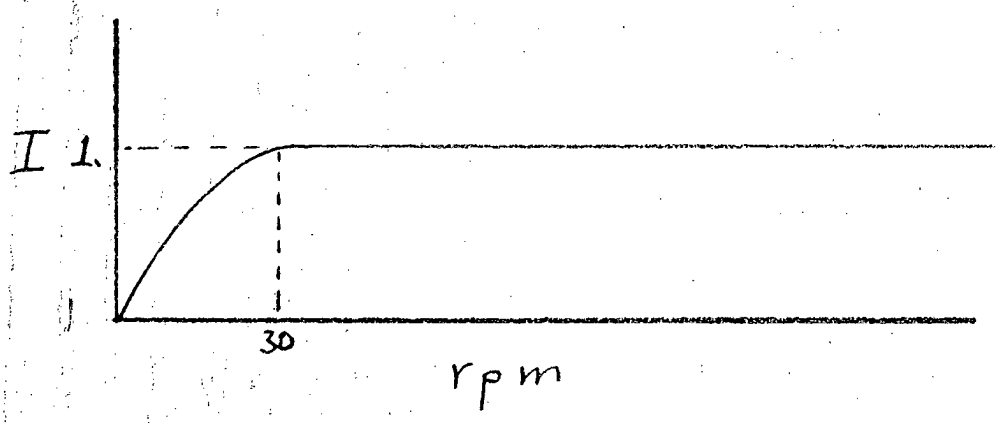


$$e = \pm N \frac{d\varphi}{dt}$$

where: N = number of turns in coil

$\varphi = \varphi_1 - \varphi_2$ (resultant flux)

$\frac{d\varphi}{dt}$ = Time rate of change of resultant flux



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